Algebra II

Sheet #551

SOLUTION KEY - See Also Answer key

Name _____ Period _____

Note: Make sure you can do each question with or without multiple choices given. Be prepared to do problems without the calculator (recognizing graphs and answering in terms of logs instead of decimals).

Write as the sum or difference of logarithms with no exponents.

1. $\log 57x$ $= \log(57) + \log(x)$

2. $\log n^5$ $= 5\log(n)$

3. $\log n^3 m^8$ $= 3\log(n) + 8\log(m)$

LOG OF POWERS: MULTIPLY BY EXPONENT.

Write as a single logarithm.

4. $\log n - \log 90$ $\log\left(\frac{n}{90}\right)$

5. $2\log m + 7\log n$ $\log\left(\frac{m^2}{n^7}\right)$

DON'T FORGET $2\log m = \log m^2$.

6. Use the formula $\log_b M = \frac{\log_a M}{\log_a b}$ to find $\log_5 137$ to the nearest thousandth.

$\log(137)/\log(5) \approx 3.057$

OR USE $LN(137)/L(5) \approx 3.057$.

Solve.

7. $2^{3x} = 64$

METHOD 2: $LN(2^{3x}) = LN(64)$; $3 \times LN(2) = LN(64)$; $X = LN(64)/LN(2)$; $3$

METHOD 1: $\log_2(2^{3x}) = \log_2(64)$; $3X = \log_2(2^6)$; $3X = 6$; $X = 2$

8. $5 = 2e^{1+x}$

LN OF BOTH SIDES.

$LN\left(\frac{5}{2}\right) = LN(e^{1+x})$

$LN(5/2) = 1 + x$ $\quad X = LN(5/2) - 1 \approx -0.084$

9. $\log_2(4 - 5x) = 2$ RAISE BOTH SIDES BY BASE 2.

$2^{\log_2(4-5x)} = 2^2$

$4 - 5x = 4$

$X = 0$

10. The future value of an investment of $P$ dollars earning an annual interest of $r$ can be calculated with the formula $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where $t$ is the number of years of the investment and $n$ is the number of compounding periods per year. Find the future value of \$2000 if it is invested for 4 years at an annual interest rate of 10% compounded every 3 months.

$A = \$2000\left(1 + \frac{0.10}{4}\right)^{4 \cdot 4}$.

$n$: # TIMES/yr $= 12/3 = 4$/yr.

$t = 4$ yrs.

$A = \$2000$

$r = 10/100 = 0.1$/yr.

$A = 2000(1.025)^{16} = \$2969.01$

→ $y = e^x - K$ HAS HORIZ. ASYMPTOTE $y = K$

11. Which of the following functions could have the graph sketched here?

A) $y = 3^{x-1}$ ✗ GROWTH, WRONG ASYMP.

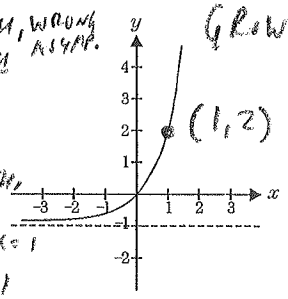
B) $y = 3^x - 1$ GROWTH

C) $y = 3^{1-x}$ ✗ DECAY

D) $y = 3^{-x} - 1$ ✗ DECAY

E) $y = e^{3x} - 1$ ✗ GROWTH, WRONG POINT $x = 1$

GROWTH




CLUES:

- HORIZONTAL ASYMPTOTE: $y = -1$
- IF $X = 1$, $y = 3^1 - 1 = 2$.

12. Which of the following functions could have the graph sketched here?

A) $f(x) = (\frac{1}{2})^x - 1$ ✗ DECAY

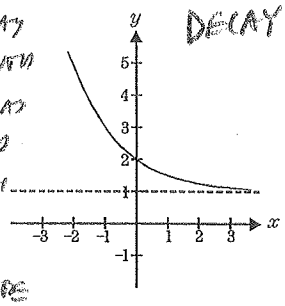
B) $f(x) = 2^x + 1$ ✗ GROWTH

C) $f(x) = 2^{-x} + 1$ DECAY

D) $f(x) = 3^{-x}$ ✗ DECAY

E) $f(x) = 3^x - 1$ ✗ GROWTH

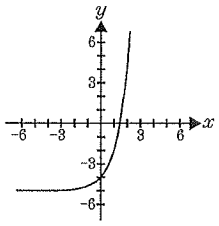
DECAY

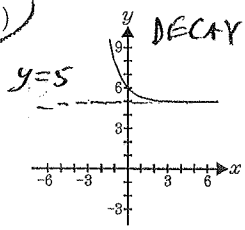



CLUE:

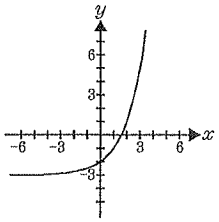
- HORIZONTAL ASYMPTOTE $y = 1$

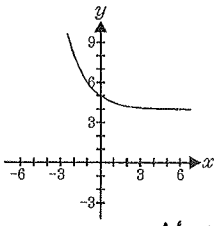
13. Which of the following could be the graph of $f(x) = 3^{-x} + 5$?

A) 

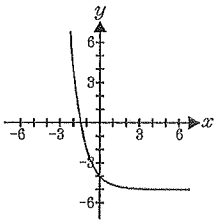
B) 

DECAY
$y=5$

C) 

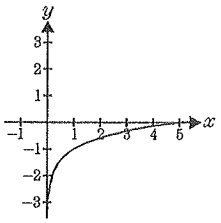
D) 

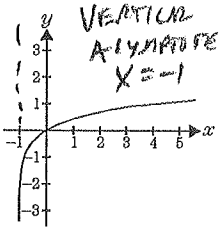
DOMAIN : all x
RANGE: $y > 5$

E) 

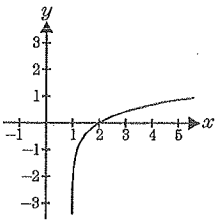
→ $y = \text{Log}(x-H)$ HAS VERTICAL ASYMPTOTE $X = H$.

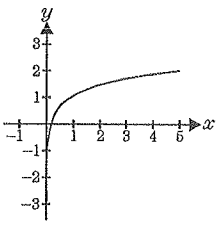
14. Which of the following is the graph of $f(x) = \log_5(x+1)$?

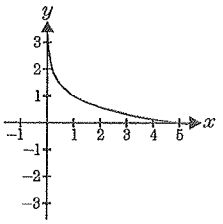
A) 

B) 

VERTICAL ASYMPTOTE $X = -1$

C) 

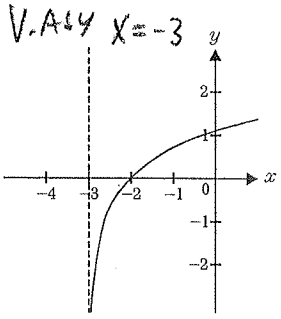
D) 

E) 

DOMAIN : $X > -1$
RANGE: all y.

15. Which of the following functions could have the graph sketched here?

V.A.Y $X = -3$



A) $f(x) = -3 + \ln x$
B) $f(x) = 3 + \ln x$
C) $f(x) = \ln(x-3)$
D) $f(x) = \ln(x+3)$
E) $f(x) = 2 + \ln(x-3)$

→ $e^{\ln(x)} = x$ and $\ln(e^x) = x$.

16. Which of the following is equal to $e^{\ln 5 + \ln x}$?

A) $\log \frac{5}{x}$
B) $x^{50}$
C) $5^{10x}$
D) $e^{5x}$
E) $5x$

$e^{\ln(5 \cdot x)} = 5x$

17. Which of the following is equal to $e^{2\ln(x-2)+3\ln y}$?

A) $y^3(x-2)^2$
B) $2^{3y(x-2)}$
C) $e^{6+\ln(x+y-2)}$
D) $\ln 3y^2(x-2)$
E) $\frac{\ln_3 y}{\ln_2(x-2)^4}$

$e^{\ln[(x-2)^2 \cdot y^3]} = (x-2)^2 y^3$

18. Choose the expression equivalent to $\ln\left(\frac{8x^2}{3y}\right)$.

A) $\ln 8 - \ln 3 + 2\ln x - \ln y$
B) $\frac{\ln 8 + \ln x^2}{\ln 3 + \ln y}$
C) $\ln(8x^2) + \ln(3y)$
D) $2\ln(8x) - \ln(3y)$
E) $\ln\left(\frac{8}{3}\right) + \ln\left(\frac{x}{y}\right)^2$

19–23 See Answer Key.